

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

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|--------------------------|--|------------------------|
| In re Appeal of | : | Confirmation No.: 9066 |
| Inventor: DUANE C. GATES | : | Group Art Unit: 3742 |
| Serial No.: 09/534,814 | : | Examiner: M. Paschall |
| Filed: March 22, 2000 | : | |
| For: | SEGMENTED COIL FOR GENERATING PLASMA IN PLASMA PROCESSING EQUIPMENT | |

APPELLANT'S BRIEF (37 C.F.R. § 1.192)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

November 22, 2004

This brief is in furtherance of the Notice of Appeal, filed in this case on September 22, 2004.

The fees required under § 1.17(f) and any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate.

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The final page of this brief bears the attorney's signature.

TABLE OF AUTHORITIES

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I. REAL PARTY IN INTEREST

The real party in interest is LAM RESEARCH CORPORATION, Fremont, California, a leading manufacturer of processors using plasmas to assist in the formation of integrated circuits..

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and/or interferences.

III. STATUS OF CLAIMS

Claims 1-38, the claims of the original patent, are allowed. Claims 39-58, the claims added during reissue prosecution, are rejected because of new matter.

IV. STATUS OF AMENDMENTS

There is no amendment after the Final Rejection. A response to the Final Rejection, has not been acknowledged by the Patent and Trademark Office. There has been no Advisory Action in response to the response to the Final Rejection, filed May 24, 2004, i.e., within the two month period subsequent to the Final Rejection. During review of the claims in connection with the preparation of this Brief, attorney for appellant noticed there was a lack of antecedent basis for the term "segment" in claims 40, 46, 51 and 54. The amendment submitted with this Brief corrects this obvious error. The Appendix and this Brief are prepared on the assumption that the correction made by the accompanying amendment will be entered to correct the obvious error.

V. SUMMARY OF INVENTION

The invention, insofar as it relates to the claims on appeal, concerns a vacuum plasma processor and a coil for such a processor. The coil couples RF fields to gas within low pressure chamber 10, having an inlet port responsive to a gas that is excited by the RF fields into a plasma

(column 1, lines 13-41, Figures 1 and 6). Workpiece W is located in the chamber and is processed by plasma in the chamber (column 1, lines 36-39). Coil 50, positioned outside the chamber, couples an RF field to the gas in the chamber (col. 1, lines 19-24; col. 3, lines 62-64). The RF field excites the gas to the plasma state (column 3, lines 49-51 and column 1, line 24). The coil includes an interior portion 52, an intermediate portion 54 and a peripheral portion (column 3, lines 53-63; column 4, line 59-column 5, line 2; Figures 3-6). The intermediate portion of the coil is a straight lead that extends between portions 52 and 54 (Figures 3-6; column 4, lines 41-44; column 2, lines 24-26). The interior, intermediate and peripheral coil portions have radially and circumferentially extending spiral turns that are connected in series with each other (column 4, lines 27-29; col. 4, lines 41-44; column 2, lines 24-26; Figures 4-6). The intermediate coil portion, being a straight lead, does not include a complete turn, is substantially less than a complete turn and is connected to ends of the turns of the interior and exterior portions 52 and 54 (Figures 3-5).

Because (1) interior and peripheral portions 52 and 54 of coil 50 are connected in series with each other and to the intermediate portion, (2) all three portions are connected to a single RF source, (3) the interior and peripheral portions include multiple turns, and (4) the intermediate portion is less than a single turn, the RF magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion. The foregoing statement is inherent in the operation of the coil and is supported by paragraph (3) of the Declaration of Dr. Roger Patrick.

VI. ISSUES

- A. The rejection of claims 39-58 based on new matter is contrary to a prior holding by the Patent and Trademark Office.
- B. The rejection of claims 39-58 because of new matter is procedurally incorrect.
- C. The rejection of claims 39-58 is substantively incorrect.

VII. GROUPING OF CLAIMS

Appellant concedes that claims 39 and 45 rise and fall together; that claims 40 and 46 rise and fall together; claims 41 and 47 rise and fall together; claims 42 and 48 rise and fall together; claims 43 and 49 rise and fall together; claims 44 and 50 rise and fall together; claims 51 and 54 rise and fall together; claims 52 and 55 rise and fall together; claims 53 and 56 rise and fall together; and claims 57 and 58 rise and fall together. Separate arguments are presented for the foregoing ten groups of claims.

VIII. ARGUMENTS

A. The rejection of claims 39-50 based on new matter is contrary to a prior holding by the Patent and Trademark Office.

Prior to the present reissue application being filed, a claim virtually identical to claim 39 was submitted in the commonly assigned Holland et al. U.S. Application Serial No. 08/931,503.

The claim of the Holland et al. application was as follows:

A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber where the workpiece is adapted to be located, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

The only difference between claim 39 of the present application and the rejected claim of the Holland et al. application is the addition, for clarity, of the word "intermediate," as set forth below:

A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber where the workpiece is adapted to be located, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for

treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior, intermediate and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

The claim of the Holland et al. application was rejected in a November 8, 2002 Office Action (of record in this file) as being anticipated by the disclosure in the original Gates patent. The Office Action includes the following statement:

The Gates reference discloses in figure 6: a vacuum processor with a chamber 10 and workpiece W; a gas inlet as shown; a matching network (see col. 5, line 1). Figure 5 shows a coil 50 with outer peripheral winding 54 and inner central winding 52 with an intermediate portion therebtween. The current inherently develops a magnetic flux density coupled to the plasma greater by the windings 52 and 54 than the connecting portion because there are more windings at the central and peripheral portions in order to yield a uniform plasma (see col. 3, lines 49-52).

The examiner who handled the Holland et al. application ruled that the Gates patent inherently included all the requirements of the Holland et al. claims. In making such a ruling, the examiner who handled the Holland et al. application ruled the magnetic flux that is coupled to the plasma by each of the interior and peripheral coil portions of the Gates patent has a density that exceeded the density of the magnetic flux coupled to the plasma by the intermediate coil portion of the original Gates patent. As a result of the position set forth in the office action in the Holland et al. application, the present reissue application was filed.

The examiner in the present case has not given any faith or credit to the position of the examiner who handled the Holland et al. application. The examiner in the present case says there is no basis in the present application for the features inherently found in the disclosure of the present case by the examiner who handled the Holland et al. application. The examiner in the present application has provided no satisfactory rationale to rebut the inherency position set forth by the examiner who handled the Holland et al. application. The position of the examiner

of the present application is that the previous position of the Patent and Trademark Office has no effect on his decision and is not controlling. The examiner handling the present application has not set forth rationale to refute the previous position of the PTO regarding the equivalency between the requirements of claim 39 of the present application, as it now stands, *vis a vis*, the rejected claim of the Holland et al. application.

Examiners of the Patent and Trademark Office act on behalf of the Commissioner of Patents. As such, the action of one examiner, when considering the issue of inherency, should be binding on the Office, as a whole, unless evidence or rationale exists to show that the original PTO position was incorrect. In the present case, no such evidence or rationale has been forthcoming. There is nothing in the record to refute the original position of the PTO that the claim in the Holland et al. application is not inherent in the disclosure of the present application.

B. The Rejection of Claims 39-58 Based on New Matter is Procedurally Wrong.

There is no basis for rejecting a claim on new matter. Instead, issues of new matter are to be raised in an objection, rather than a rejection. *In re Rasmusuen*, 650 F.2d 1212; 211 USPQ 323 (CCPA 1981); *Manual of Patent Examining Procedure*, Section 2163.06.

Even though claims 39-58 are improperly rejected for procedure reasons, appellant will consider the substantive issues associated with the present appeal, as if claims were rejected on lack of written description, under 35 USC §112, paragraph 1.

C. There is an Adequate Written Description of the Subject Matter of Claims 39-56.

It is well established that a disclosure of a device that inherently performs a function or has a property or that operates according to a theory necessarily discloses that function or theory, even though the application says nothing explicit concerning the function, property or theory. *In re Reynolds*, 443 F.2d 384, 170 USPQ 94 (CCPA 1971); *In re Smythe*, 480 F.2d 1376, 178 USPQ 279 (CCPA 1973). It is also well established that information contained in the drawings may be added to the claims. *Vas-Cath*, 935 F.2d, 15555, 1565, 19 USPQ2d, 1111, 118; *In re*

Wolfensperger, 302 F.2d 950, 133 USPQ 537 (CCPA 1962); *Autogiro Co. of America v. United States*, 384 F.2d 391, 398, 155 USPQ 697, 703 (Ct. Cl. 1967).

The examiner has not met the requirement of showing why Dr. Patrick's Declaration that provides rationale for inherency is incorrect, as required by *In re Alton*, 76 F.3d 1168, 1176, 37 USPQ2d 1578, 1584 (Fed. Cir. 1996).

Based on the foregoing principles, claims 39-56 have a clear basis from the written description of the application as filed.

The low pressure plasma processor of claim 54 reads on the disclosure of the present application as follows:

| Claim limitations | Basis |
|--|--|
| a low pressure plasma processor for treating a workpiece with a plasma | col. 1, lines 8-12. |
| a low pressure chamber where the workpiece is adapted to be located | col. 1, lines 23-26 and lines 338-39; Figs. 1 and 6; chamber 10 |
| the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece | col. 1, lines 34-39; Figs. 1 and 6 |
| a coil positioned to couple an RF field to the gas for exciting the gas plasma state | col. 1, lines 19-27; col. 2, lines 28-33; col. 3, lines 42-45; lines 53-55; col. 4, lines 21, 22, lines 36, 37, lines 59, 60; coil 50, Figs. 3-6 |
| the coil including interior, intermediate and peripheral portions | col. 3, lines 53-62; coil 50 includes inner coil portion 52, an outer coil portion 54; Fig. 3-6; Figs. 3-4 clearly indicate there is an intermediate portion of coil 50 between portions 52 and 54; also see paragraph 3, sections (1), (2), (4), (7) and (9) of Dr. Patrick's Declaration |
| the interior portion including plural radially and circumferentially extending turns | col. 2, lines 39-42; col. 3, lines 57, 58; Figs. 3-5 indicate coil portion 52 has about 2 ½ turns |
| the exterior portion having at least one circumferentially extending turn | col. 2, lines 39-42; col. 3, lines 57, 58; Figs. 3-5 indicate exterior coil portion 54 has more than 2 turns |
| the intermediate portion being configured so it (a) does not include a complete turn, (b) is | Figs. 3, 4 and 6 indicate that the intermediate portion of coil 50, connected between portions |

| | |
|--|--|
| substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions, the lead having at least a portion that is straight | 52 and 54, does not include a complete turn, is substantially less than a complete turn, includes a lead with a straight portion. The same is true in Fig. 5 when switch 52 is activated to connect at the exterior of portion 54 to the interior of portion 52. |
|--|--|

The coil of claim 51 includes all the foregoing coil requirements of claim 55.

The requirements of claims 52 and 55 for the interior, intermediate and exterior portions to be connected in series can be found from an inspection of Figs. 3-5 and at col. 3, lines 57-61; col. 4, lines 27-29; col. 4, lines 41-44; col. 2, lines 24-26. The requirement of claims 52 and 55 for the interior and exterior portions to include terminals for connection to an RF source RF is found in column 3, lines 62-64, which states:

The coil 50 includes a first inner coil portion 52 and a second outer coil portion 54. An inner tap labeled (+), and an outer tap, i.e. terminal, labeled (-) are provided to facilitate connection to the RF circuitry.

This statement, made in connection with Figure 3, is equally applicable to Figures 4-6, which show that one terminal of RF source 30 (the sentence bridging cols. 4 and 5 and Figure 6) is coupled via a cable 32 through impedance matching circuitry including loop 34 and coil 36, as well as a tuning capacitor, to the (+) terminal at the interior of interior coil portion 52 and a second terminal of the RF source is coupled to the (-) terminal at the outside of peripheral portion 54 of coil 50.

An inspection of Figures 3-5 of the application indicates exterior portion 54 of coil 50 includes the requirement of claims 53 and 56 for plural, radially and circumferentially extending turns.

An inspection of Figure 4 indicates the intermediate coil portion between interior and peripheral coil portions 52 and 54 is a lead that is straight throughout its length, as claims 57 and 58 require.

The low pressure plasma processor of claim 39 and the coil for such a processor, as defined by claim 45, can be read on the disclosure of the present application as follows:

| | |
|---|--|
| a low pressure plasma processor for treating a workpiece with a plasma | col. 1, lines 8-12. |
| a low pressure chamber where the workpiece is adapted to be located | col. 1, lines 23-26 and lines 338-39; Figs. 1 and 6; chamber 10 |
| a chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece | col. 1, lines 34-39; Figs. 1 and 6 |
| a coil positioned to couple an RF field to the gas for exciting the gas of the plasma state | col. 1, lines 19-27; col. 2, lines 28-33; col. 3, lines 42-45; lines 53-55; col. 4, lines 21, 22, lines 36, 37, lines 59, 60; coil 50, Figs. 3-6 |
| the coil including interior, intermediate and peripheral portions | col. 3, lines 53-62; coil 50 includes inner coil portion 52, an outer coil portion 54; Fig. 3-6; Figs. 3-4 clearly indicate there is an intermediate portion of coil 50 between portions S2 and S4; also see paragraph 3, sections (1), (2), (4), (7) and (9) of Dr. Patrick's Declaration |
| the interior, intermediate and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate core portion. | Because the plural turns of interior portion 52 of coil 50 are connected in series with the plural turns of exterior portion 54 of the coil by intermediate coil portion when switch S1 (Fig. 4) is open and when switch S2 (Fig. 5) connects the outer end of coil portion S2 to the inner end of coil portion S4 and the intermediate coil portion between portions 52 and 54 is a straight lead, this requirement is inherently provided by appellants' structure; see paragraph 3, sections (1), (2), (3), (4), (5), (6), and (7) of Dr. Patrick's Declaration |

The requirements of claims 40 and 46, that respectively depend on claims 39 and 45, read on the disclosure as follows:

| | |
|---|---|
| the interior portion includes plural radially and circumferentially extending turns | col. 2, lines 39-42; col. 3, lines 57, 58; Figs. 3-5 indicate coil portion 52 has about 2 ½ turns; see paragraph 3, section (8) of Dr. Patrick's Declaration |
| the exterior portion having at least one circumferentially extending turn | col. 2, lines 39-42; col. 3, lines 57, 58; Figs. 3-5 indicate exterior coil portion 54 has more than 2 turns; see paragraph 3, section (8) of Dr. Patrick's Declaration |
| the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions. | Figs. 3, 4 and 6 indicate the intermediate portion of coil 50, connected between portions 52 and 54, does not include a complete turn and is substantially less than a complete turn. The same is true of Fig. 5 when switch 52 is activated to connect at the exterior of portion 54 to the interior of portion 52. See paragraph 3, section (9) of Dr. Patrick's Declaration. |

The requirement of claims 41 and 47 for the interior and exterior portions to be connected in series is found at col. 3, lines 57-61; col. 4, lines 27-29; col. 4, lines 41-44; col. 2, lines 24-26. When switch S1 of Fig. 4 is open and switch S2 of Fig. 5 connects portions 52 and 54 in series the requirement of claims 41 and 47 for the intermediate portion to be connected in series with the interior and exterior portions is provided by appellant's disclosure. Also see paragraph 3, sections (1) and (8) of Dr. Patrick's Declaration. The further requirement of claims 41 and 47 for the interior and exterior portions to respectively include terminals for connection to a source of RF can be found at column 3, lines 62-64, which states:

The coil 50 includes a first inner coil portion 52 and a second outer coil portion 54. An inner tap labeled (+), and an outer tap, i.e. terminal, labeled (-) are provided to facilitate connection to the RF circuitry.

This statement, made in connection with Figure 3, is equally applicable to Figures 4-6. The description of Fig. 6 (col. 4, line 59-col. 5, line 2) indicates that one terminal of RF source 30 is coupled via cable 32 through impedance matching circuitry including loop 34 and coil 36, as well as a tuning capacitor, to the (+) terminal at the interior of interior coil portion 52 and a second terminal of the RF source is coupled to the (-) terminal at the outside of peripheral portion 54 of coil 50.

The requirement of claims 42 and 49 for the exterior portion to include plural radially and circumferentially extending turns is found in Figures 3-5 and the description in col. 3, lines 39-42 and col. 3, lines 57-58; also see paragraph 3, section (8) of Dr. Patrick's Declaration.

The requirement of claims 44 and 50 for the exterior portion to include spiral-like turns is apparent from an inspection of peripheral portion 54 of coil 50 of each of Figures

3-5.

D. Appellants' response to arguments set forth on page 2 of the Final Rejection.

The examiner argues, in his Response to Arguments section on page 2 of the Final Rejection, that appellant has the duty to point out the line and page where all words of the claim are set forth. This is not the law in the United States. Instead, as discussed at the beginning of this argument, inherent features and features disclosed by the drawing can be relied on as a basis for the written description requirement of the claims. This Brief and the Declaration of Dr. Patrick clearly indicate how the coil has three individual portions, as set forth in independent claims 39, 45, 51 and 54. The description need not be in *ipsis verbis* (i.e., in the same words) to be sufficient. *Martin v. Johnson*, 454 F.2d 746, 751; 172 USPQ 391, 395 (CCPA 1972). Hence, appellant need not point out the line and page where the claim requirements are formed since he has shown how the claim requirements are found in the drawing and are inherent.

The Response to Arguments on page 2 of the Final Rejection states that appellants should note that the coil specifics, such as the planar relation of one turn of the coil to another and the spatial and planar locations of one coil portion to another have not been disclosed. Firstly, most of this statement is irrelevant to the claims at issue because the claims do not mention planar

relations of one turn of the coil to another. Further, the application as filed does indicate, at column 5, line 5, that the coils can be coplanar and the drawings clearly indicate the spatial locations of the coil portions, as Dr. Patrick has testified.

In the Response to Arguments on page 2 of the Final Rejection, the examiner discusses the Hama et al. reference (USP 5,792,261); he says that because the claim feature of the present application are not inherent in Hama et al., they are not inherent in appellant's structure. However, the Hama et al. structure is illustrated as being considerably different from that of appellant's structure, as inspection of Figures 6-9 of the Hama et al. reference reveals; see the following reproductions of Figs. 6-9 of the Hama et al. patent.

U.S. Patent

Aug. 11, 1998

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5,792,261

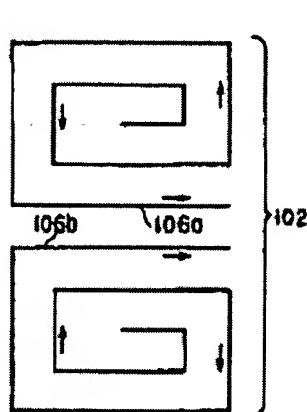


FIG. 6

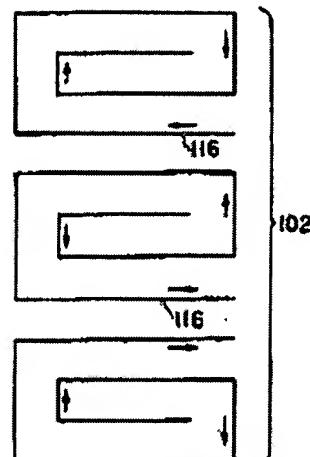


FIG. 7

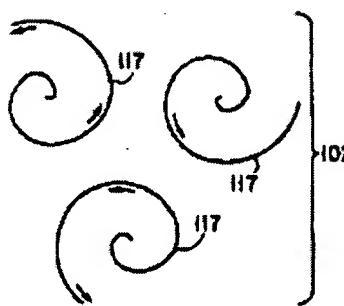


FIG. 8

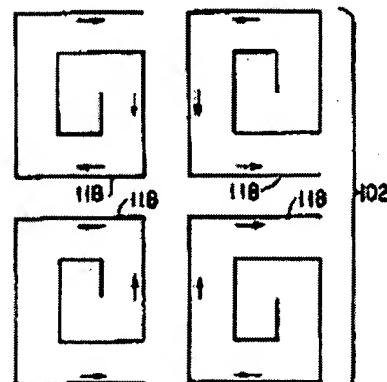


FIG. 9

Col. 3, lines 26-29, col. 6, lines 51-62; and col. 8, lines 64-col. 9, line 38 of Hama et al. describe the plan views of the coils of Figs. 6-9. Figs. 6-9 indicate the interior, intermediate and peripheral portions of the Hama et al. coils have the same properties. The examiner has conceded they do not inherently have the properties of the coils recited in appellant's claims. The plan views of appellant's coils, per Figs. 3-5 of appellant's application, are entirely different from the plan views of Figs. 6-9 of Hama et al. For each of Figs. 3-5, appellant's exterior coil

portion 54 includes more than two spiral-like turns and its interior coil portion 52 includes about 2 ½ spiral-like turns. In Figs. 3 and 4, a straight lead connects portions 52 and 54 together. Anyone with a knowledge of RF fields knows that the fields from portions 52 and 54 have greater magnetic flux density than the field from the intermediate portion of appellant's coil formed by the straight lead; paragraph 3, sections (1)-(7), of Dr. Patrick's Declaration. The examiner has not attempted to show that the Hama et al. structures illustrated in Figs. 6-9, which are so different from appellant's Figs. 3-5, include the functional and structural features of appellant's claims 39-50 or the structural features of appellant's claims 51-58. This Brief and Dr. Patrick's Declaration clearly indicate the claimed features are disclosed and/or are inherent in the present application, as was previously ruled by the PTO. Hence, the examiner's argument that appellant fails to include the features is without foundation and is contrary to the obvious differences between appellant's Figs. 3-5 and Figs. 6-9 of Hama et al.

IX. CONCLUSION

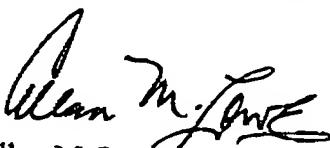
The rejection based on new matter is procedurally incorrect. Even if the rejection had been procedurally correct and had relied on the written description requirement of 35 USC §112, paragraph 1, the rejection would have been improper. The examiner fails to consider that the drawing is part of the written description. The examiner fails to give proper weight to the Patrick et al. Declaration on inherency. The examiner has never pointed out any factual incorrect aspect of the Patrick et al. Declaration and has merely brushed aside the conclusions thereof. The examiner in the present case has over-ruled a prior PTO decision that the subject matter of claim 39 is inherent in the present application.

Based on the foregoing, reversal of the rejection and allowance of claims 39-58 is in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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IX. APPENDIX OF CLAIMS INVOLVED IN THE APPEAL

39. A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber where the workpiece is adapted to be located, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior, intermediate and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

40. The processor of claim 39 wherein the interior portion includes plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions.

41. The processor of claim 40 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

42. The processor of claim 40 wherein the exterior portion includes plural radially and circumferentially extending turns.

43. The processor of claim 40 wherein the interior portion includes plural spiral like turns.

44. The processor of claim 43 wherein the exterior portion includes plural spiral like turns.

45. A coil for use with a low pressure plasma processor for treating a workpiece with an RF plasma wherein the processor includes a low pressure chamber where the workpiece is adapted to be located, and the chamber has an inlet for introducing into the chamber a gas which can be converted into the RF plasma for treating the workpiece, the coil being adapted to be positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil comprising: interior, intermediate and peripheral portions, the interior, intermediate and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

46. The coil of claim 45 wherein the interior portion includes plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions.

47. The coil of claim 46 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.
48. The coil of claim 46 wherein the exterior portion includes plural radially and circumferentially extending turns.
49. The coil of claim 46 wherein the interior portion includes plural spiral like turns.
50. The coil of claim 49 wherein the exterior portion includes plural spiral like turns.
51. A coil for use with a low pressure plasma processor for treating a workpiece with an RF plasma wherein the processor includes a low pressure chamber where the workpiece is adapted to be located, and the chamber has an inlet for introducing into the chamber a gas which can be converted into the RF plasma for treating the workpiece, the coil being adapted to be positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil comprising: interior, intermediate and peripheral portions, the interior portion including plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions, the lead having at least a portion that is straight.

52. The coil of claim 51 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

53. The coil of claim 51 wherein the exterior portion includes plural radially and circumferentially extending turns.

54. A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber where the workpiece is adapted to be located, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior portion including plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions, the lead having at least a portion that is straight.

55. The processor of claim 54 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

56. The processor of claim 54 wherein the exterior portion includes plural radially and circumferentially extending turns.

57. The coil of claim 51 wherein the lead is straight throughout its length.

58. The processor of claim 54 wherein the lead is straight throughout its length.